



Department of Pesticide Regulation



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Director

MEMORANDUM

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TO: Randy Segawa, Environmental Program Manager I
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FROM: Jay Schreider, Primary State Toxicologist
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SUBJECT: ENVIRONMENTAL MONITORING RECOMMENDATION FOR
SYNTHETIC PHEROMONE TREATMENTS TO ERADICATE THE LIGHT
BROWN APPLE MOTH

The California Department of Food and Agriculture (CDFA) proposed applications of synthetic pheromone Check Mate OLR-F[®], Check Mate LBAM-F[®], or DISRUPT Micro-Flake[®] to control/eradicate the light brown apple moth (LBAM), *Epiphyas postvittana*. CDFA has requested that the Environmental Monitoring Branch of the Department of Pesticide Regulation (DPR) conduct environmental monitoring, surface water in particular, of the treatments. All registered synthetic pheromones are in the U.S. Department of Agriculture's National Organic Program list of allowed substances, and can be used on organic crops. Check Mate OLR-F[®] contains (E)-11-tetradecen-1-yl acetate and (Z)-11-tetradecen-1-yl acetate as the active ingredients (A.I.s), Check Mate LBAM-F[®] and DISRUPT Micro-Flake[®], in addition to (E)-11-tetradecan-1-yl acetate contains (E,E)-9,11-tetradecadien-1-yl acetate.

Treatments using Check Mate OLR-F[®] at 2.92 fluid ounces of product per acre (20 grams A.I./acre) are proposed. The oral lethal dose for 50% (LD50) of the test animals is > 5,000 milligrams/kilogram (mg/kg) and inhalation LD50 > 5 milligrams/liter, resulting in a Toxicity Category IV (practically nontoxic) classification for both oral and inhalation toxicity.

Considering the low application rate and low toxicity of this class of compounds, DPR believes the proposed applications, can be performed with minimal risk to the environment and public health, and no environmental monitoring is needed for any of the application methods described on the labels.



General Information

Much of the general information in this document is taken from a 2001 U.S. Environmental Protection Agency (U.S. EPA) fact sheet, Lepidopteran Pheromones Fact Sheet. Available at: http://www.epa.gov/opbtpd1/biopesticides/ingredients/factsheets/factsheet_lep_pheromones.htm.

While the word “pheromone” sounds similar to the word “hormone,” the two groups of compounds are not the same and should not be confused. Pheromones are volatile chemicals produced, usually in very small amounts, by a given species to communicate with other individuals of the same species to change their behavior. One use of pheromones is by insects to attract a mate. These are naturally occurring in the environment and have been loosely described as “pheromone perfumes.”

Synthetically produced pheromones can be used as a pesticide. By releasing a specific pheromone mixture into the air, it is possible to confuse males looking for females. As a result, many females will not mate and lay eggs. In this case, the pheromone is triggering or interfering with a behavior, as opposed to exerting a systemic toxic effect on the insect. All registered synthetic pheromones are in the U.S. Department of Agriculture’s National Organic Program list of allowed substances.

The lepidopteran group of insects includes butterflies and moths. All of the lepidopteran pheromones approved for pesticidal use are chemicals produced by female moths to attract a mate. The pesticides contain synthetic versions of these naturally occurring compounds. The compounds contain more than one chemical, and the relative amounts of several pheromone chemicals in a pesticide product determine which specific moths are controlled. These products may be applied using slow-release dispensers (often attached to trees) or applied by ground or aerial spray equipment.

U.S. EPA states that “Based on low toxicity in animal testing, and expected low exposures to humans, no risk to human health is expected from the use of these pheromones. During more than 10 years of use of lepidopteran pheromones, no adverse effects have been reported The safety record for lepidopteran pheromones has allowed the Agency to conclude that consumption of food containing residues of the pheromones presents no risk Adverse effects on non target organisms (mammals, birds, and aquatic organisms) are not expected because these pheromones are released in very small amounts to the environment and act on a select group of insects.”

Specific Information

The various products being proposed for use on LBAM all contain the similar A.I.s. They are three pheromones, (E)-11-tetradecen-1-yl acetate, (Z)-11-tetradecen-1-yl acetate, and (E,E)-9,11-tetradecen-1-yl acetate, in different combinations and ratios. It is the combination of these chemicals and their ratio that results in the mating disruption activity for LBAM. U.S. EPA has made the determination that lepidopteran pheromones, defined as unbranched aliphatic chains (9 to 18 carbon atoms) ending in an alcohol, aldehyde, or acetate functional group and containing up to 3 double bonds in the chain, are of sufficient toxicological similarity as to be considered one group and exempt from the requirement of a food tolerance (Federal Register 60, Number 168, pages 45060 to 45062, August 30, 1995). More simply, the various pheromone chemicals used to combat moths are very similar toxicologically and toxicology data on one pheromone is applicable to the other pheromones. While toxicity studies specific to A.I.s in LBAM pheromone products are not readily available, DPR scientists have reviewed acute toxicity studies on other lepidopteran pheromones that are applicable.

These studies and data indicate that oral toxicity is very low. An oral toxicity study in rats resulted in no mortality and no toxic signs at a dosage of 5,000 mg/kg. Thus, the oral LD50 is > 5,000 mg/kg, resulting in a Category IV (practically nontoxic) classification for oral toxicity. In a rabbit dermal toxicity study using a single dose of 2,000 mg/kg, there was some diarrhea but no mortality. Thus the dermal LD50 is >2,000 mg/kg, resulting in a Category III (slightly toxic) classification for dermal toxicity. Eye and skin irritation studies indicated the potential for moderate skin irritation and mild eye irritation (Category III). U.S. EPA Reregistration Eligibility Document on Hexadecadienol cited acute toxicity data on A.I.s that indicated a low acute inhalation toxicity hazard (Category IV). While the Reregistration Eligibility Document and some tables provided by the manufacturers do not indicate the potential for dermal sensitization, a study on a chemical similar to one of the A.I.s in LBAM pheromone does indicate some potential for limited dermal sensitization (Category III).

The inert ingredients are not a toxicological concern. The dispenser formulation consists of a plastic tube containing A.I.s. The plastic tube is attached to the target plants. Another formulation is a flake made up primarily of A.I.s, a rigid plastic film, and resins. Micro-Tac[®] or Micro-Tac II[®], adjuvants, may be used with the Disrupt Micro-Flake[®] to aid in adhesion to foliage. All ingredients in both adjuvants are also exempt from the requirements of a food tolerance under 40 CFR 180.960 or on the inert list 4A or 4B.

The maximum application rates are 20 grams (about 2/3 ounce) and 25 grams of A.I. per acre per application for the flowable and flake products respectively. A maximum of 150 grams (about 5 ounces) of A.I.s per acre per year for all products is allowed. The pheromone products are encapsulated to slow their release into the atmosphere to provide efficacy from 30 to 90 days, depending on product formulation. These are very low application rates and would result in

extremely low exposure of the public. As with many pesticides, the greatest potential exposure would occur in the workers directly involved in the application of the pheromone. Personal protective equipment required by the product labels (eye protection, gloves, long sleeved shirt, long pants, etc.) for workers applying the pheromones provides appropriate protection. Given the very low toxicity and extremely low application rates, no such protection is necessary for the general public. On the basis of the available information, any risk to the public would be considered insignificant.

Environmental Monitoring

The theoretical concentrations, at highest proposed application rate, for the following media this would equal:

Deposition	= 0.460 milligrams/square foot	Deposition card (Kimbie [®])
Water	= 0.004 milligrams/liter	In a 4 feet deep pool
Air	= 0.162 milligrams/cubic meter	In a 10 foot air column, 10% vaporized
Micro-Flake [®]	= 0.570 milligrams/square foot	Deposition card, A.I. only
Micro-Flake [®]	= 1.56 milligrams/square foot	Deposition card, Plastic Film only

CDFA Center for Analytical Chemistry currently does not have analytical methods for any of the above media. The development of a deposition method does not pose any apparent problems. However, due to low application rates and matrix interactions achieving adequate detection limits in air and water may not be possible.

NonTarget Effects

Tetradecenyl acetate pheromones are common to the tortricadae family of lepidoptera. The choice of isomers and ratio is optimized for the highest efficacy with LBAM but other tortricadae will be affected. These products should not affect other Lepidoptera families. Data indicates toxicity to aquatic invertebrates and fish, although due to the volatility of A.I.s, low application rates and mitigating label language, risks to aquatic organisms will be minimal.

If the Disrupt Micro-Flake[®] product is used, 1.56 milligrams/square foot of nonbiodegradable plastic waste will be introduced into the environment. For the proposed treatment area (62 square miles), this would amount to 6,000 pounds per application. Depending on projected number of treatments, the accumulated waste product must be considered.